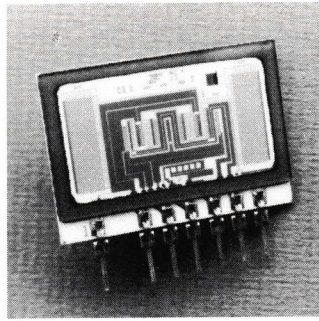


## 8840 Series



**Exclusive Hermetically-Sealed Thin-Film Resistors.** Unique to the 8842A are newly designed Hermetically-sealed Thin-Film Resistor Networks,\* which give the new 8842A greater resolution, accuracy and stability over time. This significant technological advance has made it possible to increase the instrument's calibration cycle and warranty period to two years.

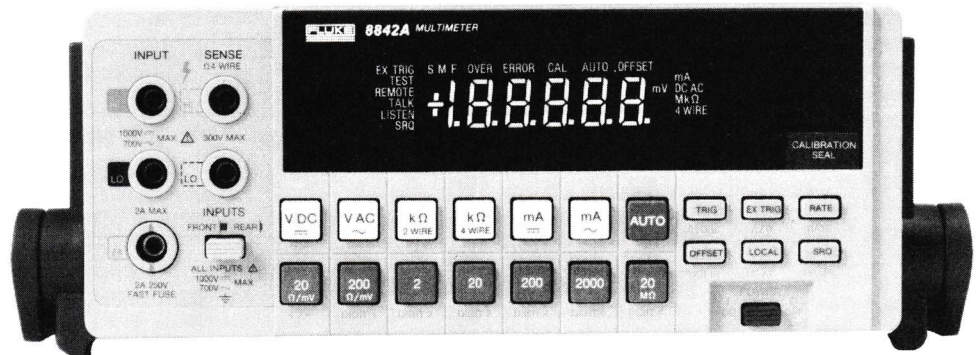
By changing the design of the resistor network, temperature induced drift has been reduced by a factor of five. A new process now makes it possible to reduce long-term aging effects by a factor of three. Hermetically sealing the resistor networks makes them impervious to change induced by moisture or humidity.

\*Patent pending



2

Designed for both system and benchtop applications, the Fluke 8840 Series delivers new standards of accuracy, autoranging, speed, resolution and convenience in 5½-digit DMMs. Fluke has made these products easy to use by incorporating bright, readable vacuum-fluorescent displays. Plus, the uncluttered front panels have been designed for one-button-per function and one-button-per range operation. The 8840A and 8842A autorange faster than other DMMs in their class, and both utilize a special Fluke-patented recirculating-remainder A/D converter to compare input voltage to a stable voltage reference for high speed, accurate measurements.



8842A

### 8840A Series: 5½-Digit Multimeters

- Basic 1-year dc accuracies to 0.003%
- Ohms and dc current standard
- Ac voltage and current optional
- Full system capability with optional IEEE-488 interface
- Up to 100 readings/second system speed
- Vacuum fluorescent display
- Closed-case calibration
- Comprehensive self test

### Performance

The 8840 Series has performance you would expect in multimeters costing much more. Basic dc accuracies to 0.003% and basic ac accuracies to 0.08% at one year are available. See the specifications that follow for complete information on measurement ranges and accuracy.

### Closed-Case Calibration

No internal adjustments are required for calibration. After you initiate calibration via a recessed front panel switch, you are led through a software controlled procedure that even double checks to ensure that appropriate reference inputs have been applied. Calibration can be performed under front panel or IEEE-488 control.

### Self Testing

The 8840 Series automatically performs a digital self test each time it is powered up. Additionally, you can initiate a comprehensive analog and digital diagnostic self test from the front panel or through the IEEE-488 interface.

### Powerful System Capabilities

Adding the inexpensive IEEE-488 interface option to the 8840 Series provides system capability which includes complete system control of functions, ranges, and reading rates. Front and rear panel inputs are switch-selectable from the front panel (and you can sense the status of the switch over the bus). Calibration and self-test can also be controlled over the bus.

Powerful yet simple device dependent IEEE-488 code allows the 8840 Series DMMs to be easily integrated into your system. System software written for the 8840A is compatible with the new 8842A and 8840A/AF.

The mechanical design also contributes to performance and convenience in system applications. The 8840A Series' metal case provides EMI shielding to ensure measurement integrity. The unit can be mounted in a half-rack slot simply by removing the handle, turning the "twist-away" rear feet, and bolting on rack-mount brackets.

Embodying all these features, the 8840 Series DMMs are fully programmable, powerful digital multimeters within reach of every system builder.

### Technology

**A monolithic A/D converter** uses CMOS IC design to achieve the superb accuracy, speed, and reliability of the 8840 Series.

**Analog switch ICs** developed by Fluke replace discrete switching devices to create superior performance, reliability, and serviceability.

**A voltage reference device** similar to that found in the Fluke 732A DC Reference Standard provides unmatched stability.

**Precision thin film resistor networks** establish the accuracy and maintain the stability of the 8840 Series.

# Digital Multimeters

## 8840 Series

### Now You Can Choose The 8840 Series DMM To Meet Your Performance Needs

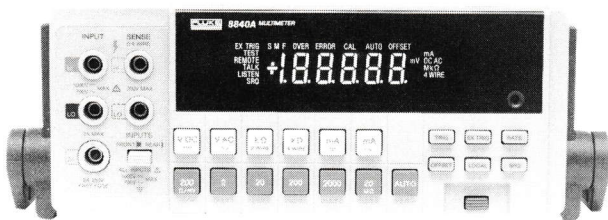


8842A

#### 8842A: Premium Performance

The 8842A, top of the 8840 line, delivers all the features of the popular 8840A plus new hermetically sealed thin film resistors. These TFRs make possible:

- **Increased measurement power:**  
100 nV resolution with a 20 mV range  
1  $\mu$ A resolution with a 200 mA range  
100  $\mu\Omega$  resolution with a 20  $\Omega$  range
- **Enhanced accuracy in V dc, V ac,  $\Omega$**   
0.003% basic dc accuracy at 1 year  
0.08% basic ac accuracy at 1 year  
0.008% basic  $\Omega$  accuracy at 1 year
- **Extended at cal cycles, with 2 year specifications**  
0.005% basic dc accuracy at 2 years
- **Two year warranty**  
See next page for detailed 8842A specifications.



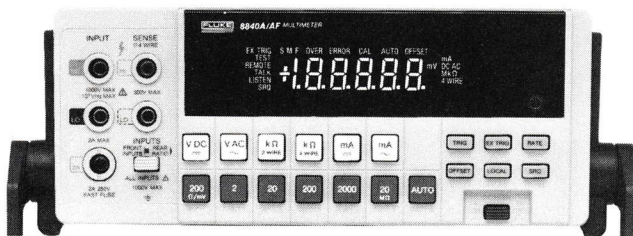
(NSN 6625-01-217-9427) 8840A

#### 8840A: The Original Value Leader

The original 8840A continues to provide an outstanding combination of low price and high performance. These features, common to all members of the 8840 Series, are responsible for the popularity of the 8840A.

- 0.005% basic dc accuracy at 1 year
- Ease of IEEE-488 system integration
- Closed case calibration
- Extensive self test
- High reliability
- Vacuum fluorescent display.

Fluke's one year warranty applies. See page 7 for detailed specifications.



(NSN 6625-01-196-0014) 8840A/AF

#### 8840A/AF: For Tough Assignments

The 8840A/AF delivers all of the 8840A capabilities, plus:

- Expanded environmental envelope
- Compliance with MIL-T-28800C Type II, Class 3, Style B
- DC/DC ratio capability in lieu of front/rear inputs
- True rms ac voltage/current capability is standard
- 1000V rms ac maximum allowable input
- Enhanced EMI/RFI protection.

National Stock Number is 6625-01-196-0014. Fluke's one year warranty applies. See page 9 for detailed specifications.

### 8842A Specifications

#### DC Voltage

##### Input Characteristics

| Range  | Full Scale<br>5½ Digits | Resolution |            | Input<br>Resistance |
|--------|-------------------------|------------|------------|---------------------|
|        |                         | 5½ Digits  | 4½ Digits* |                     |
| 20 mV  | 19.9999 mV              | 0.1 µV     | 1 µV       | ≥10,000 MΩ          |
| 200 mV | 199.999 mV              | 1 µV       | 10 µV      | ≥10,000 MΩ          |
| 2V     | 1.99999V                | 10 µV      | 100 µV     | ≥10,000 MΩ          |
| 20V    | 19.9999V                | 100 µV     | 1 mV       | ≥10,000 MΩ          |
| 200V   | 199.999V                | 1 mV       | 10 mV      | 10 MΩ               |
| 1000V  | 1000.00V                | 10 mV      | 100 mV     | 10 MΩ               |

\*4½-digits at the fastest reading rate.

#### Accuracy

**Normal (S) Reading Rate:** ±(% of Reading + Number of Counts)

| Range               | 24 Hour <sup>1</sup><br>23±1°C | 90 Day<br>23±5°C | 1 Year<br>23±5°C | 2 Year<br>23±5°C |
|---------------------|--------------------------------|------------------|------------------|------------------|
| 20 mV <sup>2</sup>  | 0.0050 + 20                    | 0.0070 + 30      | 0.0100 + 30      | 0.0120 + 40      |
| 200 mV <sup>2</sup> | 0.0030 + 2                     | 0.0045 + 3       | 0.0070 + 3       | 0.0100 + 4       |
| 2V                  | 0.0015 + 2                     | 0.0025 + 2       | 0.0030 + 2       | 0.0050 + 3       |
| 20V                 | 0.0015 + 2                     | 0.0030 + 2       | 0.0035 + 2       | 0.0060 + 3       |
| 200V                | 0.0015 + 2                     | 0.0030 + 2       | 0.0035 + 2       | 0.0060 + 3       |
| 1000V               | 0.0020 + 2                     | 0.0035 + 2       | 0.0045 + 2       | 0.0070 + 3       |

<sup>1</sup> Relative to calibration standards.

<sup>2</sup> Within one hour of dc zero, using offset control.

**Medium and Fast Rates:** In medium rate, add 2 counts (20 counts on 20 mV range) to number of counts. In fast rate, use two 4½ digit counts (20 counts on 20 mV range) for the number of counts

#### Operating Characteristics

**Temperature Coefficient:** >±(0.0006% of Reading + 0.3 Count) per °C from 18°C to 0°C and 28°C to 50°C

**Maximum Input:** 1000V dc or peak ac on any range

**Noise Rejection:** Automatically optimized at power-up for 50, 60 or 400 Hz

| Rate | Readings/<br>Second <sup>1</sup> | Filter              | NMRR <sup>2</sup> | Peak NM<br>Signal             | CMRR <sup>3</sup> |
|------|----------------------------------|---------------------|-------------------|-------------------------------|-------------------|
| S    | 2.5 <sup>5</sup>                 | Analog &<br>Digital | >98 dB            | 20V or<br>2 x FS <sup>4</sup> | >140 dB           |
| M    | 20 <sup>6</sup>                  | Digital             | >45 dB            | 1 x FS                        | >100 dB           |
| F    | 100                              | None                | —                 | 1 x FS                        | >60 dB            |

<sup>1</sup> Reading rate with internal trigger and 60 Hz power line frequency. See "Reading Rates" for more detail.

<sup>2</sup> Normal Mode Rejection Ratio, at 50 or 60 Hz ±0.1%. The NMRR for 400 Hz ±0.1% is 85 dB in S rate and 35 dB in M rate.

<sup>3</sup> Common Mode Rejection Ratio at 50 or 60 Hz ±0.1%, with 1 kΩ in series with either lead. The CMRR is >140 dB at dc for all reading rates.

<sup>4</sup> 20 volts or 2 times Full Scale whichever is greater, not to exceed 1000V.

<sup>5</sup> Reading rate — .31 rdg/sec. in the 20 mV, 20Ω, 200 mA dc ranges.

<sup>6</sup> Reading rate — 1.25 rdg/sec. in the 20 mV, 20 Ω, 200 mA dc ranges.

#### True-RMS AC Voltage (Option 8842A-09)

##### Input Characteristics

| Range  | Full Scale<br>5½ Digits | Resolution |            | Input<br>Impedance |
|--------|-------------------------|------------|------------|--------------------|
|        |                         | 5½ Digits  | 4½ Digits* |                    |
| 200 mV | 199.999 mV              | 1 µV       | 10 µV      | 1 MΩ               |
| 2V     | 1.99999V                | 10 µV      | 100 µV     | shunted            |
| 20V    | 19.9999V                | 100 µV     | 1 mV       | by                 |
| 200V   | 199.999V                | 1 mV       | 10 mV      | <100 pF            |
| 700V   | 700.00V                 | 10 mV      | 100 mV     |                    |

\*4½-digits at the fastest reading rate.

#### Accuracy

**Normal (S) Reading Rate:** ±(% of Reading + Number of Counts)

For sinewave inputs ≥10,000 counts<sup>1</sup>

| Frequency (Hz) | 24 Hours <sup>2</sup><br>23±1°C | 90 Day<br>23±5°C | 1 Year<br>23±5°C | 2 Year<br>23±5°C |
|----------------|---------------------------------|------------------|------------------|------------------|
| 20-45          | 1.2 + 100                       | 1.2 + 100        | 1.2 + 100        | 1.2 + 100        |
| 45-200         | 0.3 + 100                       | 0.35 + 100       | 0.4 + 100        | 0.5 + 100        |
| 200-20k        |                                 |                  |                  |                  |
| (200 mV)       | 0.06 + 100                      | 0.08 + 100       | 0.10 + 100       | 0.20 + 100       |
| (2V-200V)      | 0.05 + 80                       | 0.07 + 80        | 0.08 + 80        | 0.15 + 80        |
| (700V)         | 0.06 + 100                      | 0.08 + 100       | 0.10 + 100       | 0.20 + 100       |
| 20k-50k        | 0.15 + 120                      | 0.19 + 150       | 0.21 + 200       | 0.25 + 250       |
| 50k-100k       | 0.4 + 300                       | 0.5 + 300        | 0.5 + 400        | 0.5 + 500        |

<sup>1</sup> For sinewave inputs between 1,000 and 10,000 counts, add to Number of Counts 100 counts for frequencies 20 Hz to 20 kHz, 200 counts for 20 kHz to 50 kHz, and 500 counts for 50 kHz to 100 kHz.

<sup>2</sup> Relative to calibration standards.

**Medium and Fast Rates:** In medium rate, add 50 counts to number of counts. In fast rate the specifications apply for sinewave inputs ≥1000 4½ digit counts and >100 Hz

**Nonsinusoidal Inputs:** For nonsinusoidal inputs ≥10,000 counts with frequency components ≤100 kHz, add the following % of reading to the accuracy specifications

| Fundamental<br>Frequency               | Crest Factor |            |            |
|----------------------------------------|--------------|------------|------------|
|                                        | 1.0 to 1.5   | 1.5 to 2.0 | 2.0 to 3.0 |
| 45 Hz to 20 kHz                        | 0.05         | 0.15       | 0.3        |
| 20 Hz to 45 Hz and<br>20 kHz to 50 kHz | 0.2          | 0.7        | 1.5        |

#### Operating Characteristics

**Maximum Input:** 700V rms, 1000V peak or 2 x 10<sup>7</sup> Volts-Hertz product (whichever is less) for any range

**Temperature Coefficient:** ±(% of Reading + Number of Counts) per °C, 0°C to 18°C and 28°C to 50°C

| For Inputs     | Frequency in Hertz |            |            |
|----------------|--------------------|------------|------------|
|                | 20-20k             | 20k-50k    | 50k-100k   |
| ≥10,000 counts | 0.019 + 9          | 0.021 + 9  | 0.027 + 10 |
| ≥1,000 counts  | 0.019 + 12         | 0.021 + 15 | 0.027 + 21 |

**Common Mode Rejection:** >60 dB at 50 or 60 Hz with 1 kΩ in either lead

#### Current

##### Input Characteristics

| Range   | Full Scale<br>5½ Digits | Resolution |            |
|---------|-------------------------|------------|------------|
|         |                         | 5½ Digits  | 4½ Digits* |
| 200 mA  | 199.999 mA              | 1 µA       | 10 µA      |
| 2000 mA | 1999.99 mA              | 10 µA      | 100 µA     |

\*4½ digits at the fastest reading rate.

#### DC Accuracy

**Normal (S) Reading Rate:** ±(% of Reading + Number of Counts)

| Range   | 90 Days 23±5°C | 1 Year 23±5°C | 2 Years 23±5°C |
|---------|----------------|---------------|----------------|
| 200 mA  | 0.04 + 40      | 0.05 + 40     | 0.08 + 40      |
| 2000 mA |                |               |                |
| ≤1A     | 0.04 + 4       | 0.05 + 4      | 0.08 + 4       |
| >1A     | 0.1 + 4        | 0.1 + 4       | 0.15 + 4       |

**Medium and Fast Rates:** In medium reading rate, add 2 counts (20 counts on 20 mA range) to number of counts. In fast reading rate, use two 4½ digit counts (20 counts on 200 mA range) for number of counts

# Digital Multimeters

## 8840 Series

### AC Accuracy (Requires Option 8842A-09)

**Normal (S) Reading Rate:**  $\pm$ (% of Reading + Number of Counts)  
 $23^{\circ}\pm 5^{\circ}\text{C}$ , for sinewave inputs  $\geq 10,000$  counts

|           | Frequency in Hertz |           |           |
|-----------|--------------------|-----------|-----------|
|           | 20-45              | 45-100    | 100-5k*   |
| One Year  | 2.0 + 200          | 0.5 + 200 | 0.4 + 200 |
| Two Years | 3.0 + 300          | 0.7 + 300 | 0.6 + 300 |

\*Typically 20 kHz

**Medium and Fast Reading Rates:** In medium reading rate, add 50 counts to number of counts. In fast reading rate, for sinewave inputs  $\geq 1000$  4½ digit counts and frequencies  $> 100$  Hz, the accuracy is  $\pm(0.2\%$  of reading + 30 counts)

**Nonsinusoidal Inputs:** For nonsinusoidal inputs  $\geq 10,000$  counts with frequency components  $\leq 100$  kHz, add the following % of reading to the accuracy specifications

| Fundamental Frequency | Crest Factor |            |            |
|-----------------------|--------------|------------|------------|
|                       | 1.0 to 1.5   | 1.5 to 2.0 | 2.0 to 3.0 |
| 45 Hz to 5 kHz        | 0.05         | 0.15       | 0.3        |
| 20 Hz to 45 Hz        | 0.2          | 0.7        | 1.5        |

### Operating Characteristics

**Temperature Coefficient:** Less than 0.1 x accuracy specification per  $^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $18^{\circ}\text{C}$  and  $28^{\circ}\text{C}$  to  $50^{\circ}\text{C}$

**Maximum Input:** 2A dc or rms ac. Protected with 2A, 250V fuse accessible at front panel, and internal 3A, 600V fuse

**Burden Voltage:** 1V dc or rms ac typical at full scale

### Resistance

#### Input Characteristics

| Range                    | Full Scale<br>5½ Digits | Resolution     |                        | Current<br>Through<br>Unknown |
|--------------------------|-------------------------|----------------|------------------------|-------------------------------|
|                          |                         | 5½ Digits      | 4½ Digits <sup>1</sup> |                               |
| 20 $\Omega$ <sup>2</sup> | 19.9999 $\Omega$        | 0.1 m $\Omega$ | 1 m $\Omega$           | 1 mA                          |
| 200 $\Omega$             | 199.999 $\Omega$        | 1 m $\Omega$   | 10 m $\Omega$          | 1 mA                          |
| 2 k $\Omega$             | 1.99999 k $\Omega$      | 10 m $\Omega$  | 100 m $\Omega$         | 1 mA                          |
| 20 k $\Omega$            | 19.9999 k $\Omega$      | 100 m $\Omega$ | 1 $\Omega$             | 100 $\mu\text{A}$             |
| 200 k $\Omega$           | 199.999 k $\Omega$      | 1 $\Omega$     | 10 $\Omega$            | 10 $\mu\text{A}$              |
| 2000 k $\Omega$          | 1999.99 k $\Omega$      | 10 $\Omega$    | 100 $\Omega$           | 5 $\mu\text{A}$               |
| 20 M $\Omega$            | 19.9999 M $\Omega$      | 100 $\Omega$   | 1 k $\Omega$           | 0.5 $\mu\text{A}$             |

<sup>1</sup> 4½ digits at the fastest reading rate

<sup>2</sup> 4-wire ohms only

### Accuracy

**Normal (S) Reading Rate:**  $\pm$ (% of Reading + Number of Counts)<sup>1</sup>

| Range                    | 24 Hour <sup>2</sup><br>23 $\pm$ 1 $^{\circ}\text{C}$ | 90 Day<br>23 $\pm$ 5 $^{\circ}\text{C}$ | 1 Year<br>23 $\pm$ 5 $^{\circ}\text{C}$ | 2 Year<br>23 $\pm$ 5 $^{\circ}\text{C}$ |
|--------------------------|-------------------------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| 20 $\Omega$ <sup>3</sup> | 0.007 + 30                                            | 0.009 + 40                              | 0.012 + 40                              | 0.015 + 40                              |
| 200 $\Omega$             | 0.0040 + 3                                            | 0.007 + 4                               | 0.010 + 4                               | 0.012 + 4                               |
| 2 k $\Omega$             | 0.0025 + 2                                            | 0.005 + 3                               | 0.008 + 3                               | 0.010 + 3                               |
| 20 k $\Omega$            | 0.0025 + 2                                            | 0.005 + 3                               | 0.008 + 3                               | 0.010 + 3                               |
| 200 k $\Omega$           | 0.0025 + 2                                            | 0.006 + 3                               | 0.010 + 3                               | 0.012 + 3                               |
| 2000 k $\Omega$          | 0.023 + 3                                             | 0.025 + 3                               | 0.027 + 3                               | 0.030 + 3                               |
| 20 M $\Omega$            | 0.023 + 3                                             | 0.040 + 4                               | 0.042 + 4                               | 0.050 + 4                               |

<sup>1</sup> Within one hour of ohms zero, using offset control.

<sup>2</sup> Relative to calibration standards.

<sup>3</sup> 4-wire ohms only

**Medium and Fast Reading Rates:** In medium rate, add 2 counts to the number of counts for the 200 $\Omega$  through 200 k $\Omega$  ranges, 3 counts for the 2000 k $\Omega$  and 20 M $\Omega$  ranges, and 20 counts for the 20 $\Omega$  range. In fast

reading rate, use three 4½ digit for the number of counts for the 200 $\Omega$  range, 20 4½ digit counts for the 20 $\Omega$  range, and two 4½ digit for all other ranges

### Operating Characteristics

**Temperature Coefficient:** Less than 0.1 x accuracy specification per  $^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $18^{\circ}\text{C}$  and  $28^{\circ}\text{C}$  to  $50^{\circ}\text{C}$

**Measurement Configuration:** 2-wire or 4-wire (20 $\Omega$  range is 4-wire only)

**Open Circuit Voltage:** Less than 6.5V on the 20 $\Omega$  through 200 k $\Omega$  ranges. Less than 13V on the 2000 k $\Omega$  and 20 M $\Omega$  ranges

**Input Protection:** To 300V rms

### Reading Rates and Ranging

**Reading Rates With Internal Trigger** (readings per second):

| Rate | Power Line Frequency <sup>1</sup> |                         |                           |
|------|-----------------------------------|-------------------------|---------------------------|
|      | 50 Hz                             | 60 Hz                   | 400 Hz                    |
| S    | 2.08 (.26 <sup>2</sup> )          | 2.5 (.31 <sup>2</sup> ) | 2.38 (.30 <sup>2</sup> )  |
| M    | 16.7 (1.04 <sup>2</sup> )         | 20 (1.25 <sup>2</sup> ) | 19.0 (1.19 <sup>2</sup> ) |
| F    | 100                               | 100                     | 100                       |

<sup>1</sup> Sensed automatically at power-up.

<sup>2</sup> In the 20 mV, 20 $\Omega$ , and 200 mA ranges. The 8842A does not autorange down into these ranges. To access these ranges, select the specific range, from the front panel or over the bus.

## General Specifications

**Option -05 IEEE-488 Interface Function:** Option allows complete control and data output capability, and supports the following interface function subsets: SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, E1, PP0 and C0  
**Common Mode Voltage:** 1000V dc or peak ac, or 700V rms ac from any input to earth ground

**Temperature Range:**  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  operating;  $-40^{\circ}\text{C}$  to  $70^{\circ}\text{C}$  storage

**Humidity Range:** 80% RH from 0 to  $35^{\circ}\text{C}$ ; 70% to  $50^{\circ}\text{C}$

**Warmup Time:** 1 hour to rated specifications

**Power:** 100, 120, 220, or 240V ac  $\pm 10\%$  (250V ac maximum), switch selectable at rear panel; 50, 60, or 400 Hz, automatically sensed at power up; 20 VA maximum

**Vibration:** Meets requirements of MIL-T-28800C for Type II, Class 3, Style E equipment

**Safety:** ANSI C39.5 and IEC 348, Class I

**Size:** 8.9 cm H x 21.6 cm W x 37.1 cm D (3.5 in x 8.5 in x 14.6 in)

**Weight:** Net, 3.4 kg (7.5 lb); shipping 5 kg (11 lb)

**Warranty Period:** Two years

**Included:** Line cord, test leads, Instruction/Service Manual, IEEE-488 Quick Reference Guide and instrument performance verification record

## Model

**8842A\*** Digital Multimeter

\*Option -09 needed to measure ac

## Options

**8842A-05** IEEE-488 Interface

**8842A-05K** Field Installable IEEE-488 Interface

**8842A-09** True-RMS AC

**8842A-09K** Field Installable True-RMS AC

## Accessories (Also see page 63)

**Y8834** Single Rack Mount Kit

**Y8835** Dual Rack Mount Kit

**Y8836** Center Rack Mount Kit

**Y8021** 1m IEEE-488 Shielded Cable

**Y8022** 2m IEEE-488 Shielded Cable

**Y8023** 4m IEEE-488 Shielded Cable

**Y8077** Four Terminal Short

**A90** 6-Range Current Shunt

### 8840A Specifications

#### DC Voltage Input Characteristics

| Range  | Full Scale<br>5½ Digits | Resolution |           | Input<br>Resistance |
|--------|-------------------------|------------|-----------|---------------------|
|        |                         | 5½ Digits  | 4½ Digits |                     |
| 200 mV | 199.999 mV              | 1 µV       | 10 µV     | ≥10,000 MΩ          |
| 2V     | 1.99999V                | 10 µV      | 100 µV    | ≥10,000 MΩ          |
| 20V    | 19.9999V                | 100 µV     | 1 mV      | ≥10,000 MΩ          |
| 200V   | 199.999V                | 1 mV       | 10 mV     | 10 MΩ               |
| 1000V  | 1000.00V                | 10 mV      | 100 mV    | 10 MΩ               |

\*4½-digits at the fastest reading rate.

#### Accuracy

Normal (S) Reading Rate: ±(% of Reading + Number of Counts)

| Range    | 24 Hour*<br>23±1°C | 90 Day<br>23±5°C | 1 Year<br>23±5°C |
|----------|--------------------|------------------|------------------|
| 200 mV** | 0.003 + 3          | 0.007 + 4        | 0.008 + 4        |
| 2V       | 0.002 + 2          | 0.004 + 3        | 0.005 + 3        |
| 20V      | 0.002 + 2          | 0.005 + 3        | 0.006 + 3        |
| 200V     | 0.002 + 2          | 0.005 + 3        | 0.006 + 3        |
| 1000V    | 0.003 + 2          | 0.005 + 3        | 0.007 + 3        |

\*Relative to calibration standards.

\*\*Using Offset control

**Medium and Fast Rates:** In medium rate, add 2 counts to number of counts. In fast rate, use two 4½ digit counts

#### Operating Characteristics

**Temperature Coefficient:** ≥±(0.0006% of Reading + 0.3 Count) per °C from 18°C to 0°C and 28°C to 50°C

**Maximum Input:** 1000V dc or peak ac on any range

**Noise Rejection:** Automatically optimized at power-up for 50, 60 or 400 Hz

| Rate | Readings/<br>Second <sup>1</sup> | Filter              | NMRR <sup>2</sup> | Peak NM<br>Signal             | CMRR <sup>3</sup> |
|------|----------------------------------|---------------------|-------------------|-------------------------------|-------------------|
| S    | 2.5                              | Analog &<br>Digital | >98 dB            | 20V or<br>2 x FS <sup>4</sup> | >140 dB           |
| M    | 20                               | Digital             | >45 dB            | 1 x FS                        | >100 dB           |
| F    | 100                              | None                | —                 | 1 x FS                        | >60 dB            |

<sup>1</sup> Reading rate with internal trigger and 60 Hz power line frequency. See "Reading Rates" for more detail.

<sup>2</sup> Normal Mode Rejection Ratio, at 50 or 60 Hz ±0.1%. The NMRR for 400 Hz ±0.1% is 85 dB in S rate and 35 dB in M rate.

<sup>3</sup> Common Mode Rejection Ratio at 50 or 60 Hz ±0.1%, with 1 kΩ in series with either lead. The CMRR is >140 dB at dc for all reading rates.

<sup>4</sup> 20 volts or 2 times Full Scale whichever is greater, not to exceed 1000V.

#### True-RMS AC Voltage Option (8840A-09)

##### Input Characteristics

| Range  | Full Scale<br>5½ Digits | Resolution |            | Input<br>Impedance |
|--------|-------------------------|------------|------------|--------------------|
|        |                         | 5½ Digits  | 4½ Digits* |                    |
| 200 mV | 199.999 mV              | 1 µV       | 10 µV      | 1 MΩ               |
| 2V     | 1.99999V                | 10 µV      | 100 µV     | shunted            |
| 20V    | 19.9999V                | 100 µV     | 1 mV       | by                 |
| 200V   | 199.999V                | 1 mV       | 10 mV      | <100 pF            |
| 700V   | 700.00V                 | 10 mV      | 100 mV     |                    |

\*4½-digits at the fastest reading rate.

#### Accuracy

Normal (S) Reading Rate: ±(% of Reading + Number of Counts)

For sinewave inputs ≥10,000 counts<sup>1</sup>

| Frequency (Hz) | 24 Hours <sup>2</sup><br>23±1°C | 90 Day<br>23±5°C | 1 Year<br>23±5°C |
|----------------|---------------------------------|------------------|------------------|
| 20-45          | 1.2 + 100                       | 1.2 + 100        | 1.2 + 100        |
| 45-100         | 0.3 + 100                       | 0.35 + 100       | 0.4 + 100        |
| 100-20k        | 0.07 + 100                      | 0.14 + 100       | 0.16 + 100       |
| 20k-50k        | 0.15 + 120                      | 0.19 + 150       | 0.21 + 200       |
| 50k-100k       | 0.4 + 300                       | 0.5 + 300        | 0.5 + 400        |

<sup>1</sup> For sinewave inputs between 1,000 and 10,000 counts, add to Number of Counts 100 counts for frequencies 20 Hz to 20 kHz, 200 counts for 20 kHz to 50 kHz, and 500 counts for 50 kHz to 100 kHz.

<sup>2</sup> Relative to calibration standards.

**Medium and Fast Reading Rates:** In medium rate, add 50 counts to number of counts. In fast rate the specifications apply for sinewave inputs ≥1000 4½ digit counts and >100 Hz

#### Operating Characteristics

**Temperature Coefficient:** ±(% of Reading + Number of Counts) per °C, 0°C to 18°C and 28°C to 50°C

| For Inputs     | Frequency in Hertz |            |            |
|----------------|--------------------|------------|------------|
|                | 20-20k             | 20k-50k    | 50k-100k   |
| ≥10,000 counts | 0.019 + 9          | 0.021 + 9  | 0.027 + 10 |
| ≥1,000 counts  | 0.019 + 12         | 0.021 + 15 | 0.027 + 21 |

# Digital Multimeters

## 8840 Series

**Nonsinusoidal Inputs:** For nonsinusoidal inputs  $\geq 10,000$  counts with frequency components  $\leq 100$  kHz, add the following % of reading to the accuracy specifications

| Fundamental Frequency                  | 1.0 to 1.5* | 1.5 to 2.0* | 2.0 to 3.0* |
|----------------------------------------|-------------|-------------|-------------|
| 45 Hz to 20 kHz                        | 0.05        | 0.15        | 0.3         |
| 20 Hz to 45 Hz and<br>20 kHz to 50 kHz | 0.2         | 0.7         | 1.5         |

\*Crest Factor

**Maximum Input:** 700V rms, 1000V peak or  $2 \times 10^7$  Volts-Hertz product (whichever is less) for any range

**Common Mode Rejection:**  $>60$  dB at 50 or 60 Hz with 1 k $\Omega$  in either lead

### Current Input Characteristics

| Range   | Full Scale<br>5½ Digits | Resolution |             |
|---------|-------------------------|------------|-------------|
|         |                         | 5½ Digits  | 4½ Digits*  |
| 2000 mA | 1999.99 mA              | 10 $\mu$ A | 100 $\mu$ A |

\*4½ digits at the fastest reading rate.

### DC Accuracy

**Normal (S) Reading Rate:**  $\pm$ (% of Reading + Number of Counts)

| Current    | 90 Days 23 $\pm$ 5°C | 1 Year 23 $\pm$ 5°C |
|------------|----------------------|---------------------|
| $\leq 1$ A | 0.04 + 4             | 0.05 + 4            |
| $> 1$ A    | 0.1 + 4              | 0.1 + 4             |

**Medium and Fast Reading Rates:** In medium reading rate, *add* 2 counts to number of counts. In fast reading rate, *use* two 4½ digit counts for number of counts

**AC Accuracy** (Requires Option 8840A-09)

**Normal (S) Reading Rate:**  $\pm$ (% of Reading + Number of Counts)

1 Year, 23 $\pm$ 5°C, for sine wave inputs  $\geq 10,000$  counts

| Frequency in Hertz |           |           |
|--------------------|-----------|-----------|
| 20-45              | 45-100    | 100-5k*   |
| 2.0 + 200          | 0.5 + 200 | 0.4 + 200 |

\*Typically 20 kHz

**Medium and Fast Reading Rates:** In medium rate, *add* 50 counts to number of counts. In fast reading rate, for sine wave inputs  $\geq 1000$  4½ digit counts and frequencies  $>100$  Hz, the accuracy is  $\pm$ (0.2% of reading + 30 counts)

### Operating Characteristics

**Temperature Coefficient:** Less than 0.1 x accuracy specification per °C from 0°C to 18°C and 28°C to 50°C

**Maximum Input:** 2A dc or rms ac. Protected with 2A, 250V fuse accessible at front panel, and internal 3A, 600V fuse

**Burden Voltage:** 1V dc or rms ac typical at full scale

### Resistance Input Characteristics

| Range           | Full Scale<br>5½ Digits | Resolution     |                | Current Through Unknown |
|-----------------|-------------------------|----------------|----------------|-------------------------|
|                 |                         | 5½ Digits      | 4½ Digits*     |                         |
| 200 $\Omega$    | 199.999 $\Omega$        | 1 m $\Omega$   | 10 m $\Omega$  | 1 mA                    |
| 2 k $\Omega$    | 1.99999 k $\Omega$      | 10 m $\Omega$  | 100 m $\Omega$ | 1 mA                    |
| 20 k $\Omega$   | 19.9999 k $\Omega$      | 100 m $\Omega$ | 1 $\Omega$     | 100 $\mu$ A             |
| 200 k $\Omega$  | 199.999 k $\Omega$      | 1 $\Omega$     | 10 $\Omega$    | 10 $\mu$ A              |
| 2000 k $\Omega$ | 1999.99 k $\Omega$      | 10 $\Omega$    | 100 $\Omega$   | 5 $\mu$ A               |
| 20 M $\Omega$   | 19.9999 M $\Omega$      | 100 $\Omega$   | 1 k $\Omega$   | 0.5 $\mu$ A             |

\*4½ digits at the fastest reading rate

### Accuracy

**Normal (S) Reading Rate:**  $\pm$ (% of Reading + Number of Counts)<sup>1</sup>

| Range           | 24 Hour <sup>2</sup><br>23 $\pm$ 1°C | 90 Day<br>23 $\pm$ 5°C | 1 Year<br>23 $\pm$ 5°C |
|-----------------|--------------------------------------|------------------------|------------------------|
| 200 $\Omega$    | 0.004 + 3                            | 0.011 + 4              | 0.014 + 4              |
| 2 k $\Omega$    | 0.0028 + 2                           | 0.01 + 3               | 0.013 + 3              |
| 20 k $\Omega$   | 0.0028 + 2                           | 0.01 + 3               | 0.013 + 3              |
| 200 k $\Omega$  | 0.0028 + 2                           | 0.01 + 3               | 0.013 + 3              |
| 2000 k $\Omega$ | 0.023 + 3                            | 0.027 + 3              | 0.028 + 3              |
| 20 M $\Omega$   | 0.023 + 3                            | 0.043 + 4              | 0.044 + 4              |

<sup>1</sup> Using Offset control. <sup>2</sup> Relative to calibration standards.

**Medium and Fast Reading Rates:** In medium rate, *add* to the number of counts 2 counts for the 200 $\Omega$  through 200 k $\Omega$  ranges and 3 counts for the 2000 k $\Omega$  and 20 M $\Omega$  ranges. In fast reading rate, *use* for the number of counts three 4½ digit counts for the 200 $\Omega$  range and two 4½ digit counts

### Operating Characteristics

**Temperature Coefficient:** Less than 0.1 x accuracy specification per °C from 0°C to 18°C and 28°C to 50°C

**Measurement Configuration:** 2-wire or 4-wire

**Open Circuit Voltage:** Less than 6.5V on the 200 $\Omega$  through 200 k $\Omega$  ranges. Less than 13V on the 2000 k $\Omega$  and 20 M $\Omega$  ranges

**Input Protection:** To 300V rms

### Reading Rates

**Reading Rates With Internal Trigger** (readings per second):

| Rate | Power Line Frequency <sup>1</sup> |       |        |
|------|-----------------------------------|-------|--------|
|      | 50 Hz                             | 60 Hz | 400 Hz |
| S    | 2.08                              | 2.5   | 2.38   |
| M    | 16.7                              | 20    | 19.0   |
| F    | 100                               | 100   | 100    |

\*Sensed automatically at power-up

## General Specifications

**Option -05 IEEE-488 Interface Function:** Option allows complete control and data output capability, and supports the following interface function subsets: SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, E1, PP0 and C0

**Common Mode Voltage:** 1000V dc or peak ac, or 700V rms ac from any input to earth ground

**Temperature Range:** 0°C to 50°C operating; -40°C to 70°C storage

**Humidity Range:** 80% RH from 0 to 35°C; 70% to 50°C

**Warmup Time:** 1 hour to rated specifications

**Power:** 100, 120, 220, or 240V ac  $\pm$ 10% (250V ac maximum), switch selectable at rear panel; 50, 60, or 400 Hz, automatically sensed at power up; 20 VA maximum

**Vibration:** Meets requirements of MIL-T-28800C for Type III, Class 3, Style E equipment

**Safety:** ANSI C39.5 and IEC 348, Class I and VDE 0411 Marks License

**Size:** 8.9 cm H x 21.6 cm W x 37.1 cm D (3.5 in x 8.5 in x 14.6 in)

**Weight:** Net, 3.4 kg (7.5 lb); shipping 5 kg (11 lb)

**Warranty Period:** One year

**Included:** Line cord, test leads, Instruction/Service Manual, IEEE-488 Quick Reference Guide, instrument performance verification record, and serialized/dated calibration certification sheet

## Model

**8840A\*** Digital Multimeter

\*Option -09 needed to measure ac

## Options

**8840A-05** IEEE-488 Interface

**8840A-05K** Field Installable IEEE-488 Interface

**8840A-09** True-RMS AC

**8840A-09K** Field Installable True-RMS AC

### Accessories (Also see page 63)

**Y8834** Single Rack Mount Kit  
**Y8835** Dual Rack Mount Kit  
**Y8836** Center Rack Mount Kit  
**Y8021** 1m IEEE-488 Shielded Cable  
**Y8022** 2m IEEE-488 Shielded Cable  
**Y8023** 4m IEEE-488 Shielded Cable  
**Y8077** Four Terminal Short  
**A90** 6-Range Current Shunt  
 Also see page 284 for more accessory information.

### Service & Support

### Operating Characteristics

**Temperature Coefficient:**  $\geq \pm(0.0006\% \text{ of Reading} + 0.3 \text{ Count})$  per °C from 18°C to 0°C and 28°C to 50°C

**Maximum Input:** 1000V dc or peak ac on any range

**Noise Rejection:** Automatically optimized at power-up for 50, 60 or 400 Hz

| Rate | Readings/Second <sup>1</sup> | Filter           | NMRR <sup>2</sup> | Peak NM Signal             | CMRR <sup>3</sup> |
|------|------------------------------|------------------|-------------------|----------------------------|-------------------|
| S    | 2.5                          | Analog & Digital | >98 dB            | 20V or 2 x FS <sup>4</sup> | >140 dB           |
| M    | 20                           | Digital          | >45 dB            | 1 x FS                     | >100 dB           |
| F    | 100                          | None             | —                 | 1 x FS                     | >60 dB            |

<sup>1</sup> Reading rate with internal trigger and 60 Hz power line frequency. See "Reading Rates" for more detail

<sup>2</sup> Normal Mode Rejection Ratio, at 50 or 60 Hz  $\pm 0.1\%$ . The NMRR for 400 Hz  $\pm 0.1\%$  is 85 dB in S rate and 35 dB in M rate

<sup>3</sup> Common Mode Rejection Ratio at 50 or 60 Hz  $\pm 0.1\%$ , with 1 k $\Omega$  in series with either lead. The CMRR is >140 dB at dc for all reading rates

<sup>4</sup> 20 volts or 2 times Full Scale whichever is greater, not to exceed 1000V

### DC Voltage Ratio

#### Input Characteristics

| Range | Full Scale<br>5½ Digits | Input Voltage |                               | Reference Voltage          |                               |
|-------|-------------------------|---------------|-------------------------------|----------------------------|-------------------------------|
|       |                         | Full Scale    | Input Resistance              | Range                      | Input Resistance              |
| 200m* | 199.999m DC*            | 199.999mV dc  | $\geq 10,000 \text{ M}\Omega$ | From +1V dc to +19.999V dc | $\geq 10,000 \text{ M}\Omega$ |
| 2     | 1.99999 DC              | 1.99999V dc   | $\geq 10,000 \text{ M}\Omega$ |                            |                               |
| 20    | 19.9999 DC              | 19.9999V dc   | $\geq 10,000 \text{ M}\Omega$ |                            |                               |
| 200   | 199.999 DC              | 199.999V dc   | $\geq 10 \text{ M}\Omega$     |                            |                               |
| 1000  | 1000.00 DC              | 1000V dc      | $\geq 10 \text{ M}\Omega$     |                            |                               |

\*The "m" (milli) annunciator lights to indicate a  $10^{-3}$  multiplier. Divide the displayed number by 1000 to obtain the actual ratio of the two voltages.

### Accuracy:

$\pm(\text{Percentage of Reading} + \text{Number of Counts})$  for 1 year

| Reference Voltage           | Temperature                          |                                       |
|-----------------------------|--------------------------------------|---------------------------------------|
|                             | 20°C to 30°C                         | 0°C to 55°C                           |
| +10V <VREF <+20V            | 0.01 + 5                             | 0.04 + 15                             |
| +1V $\leq$ VREF $\leq$ +10V | $(0.01 + 5) \times \frac{10V}{VREF}$ | $(0.04 + 15) \times \frac{10V}{VREF}$ |

### Operating Characteristics

**Maximum Input:** 1000V dc or rms ac on any range

**Note:** The INPUT LO terminal must be connected to the REFERENCE LO terminal. If these terminals are not connected together, inaccurate readings may result. These terminals are not connected together internally.

**Reading Rates:** Readings Per Second (With Internal Trigger)

| Rate | Power Line Frequency |       |        |
|------|----------------------|-------|--------|
|      | 50 Hz                | 60 Hz | 400 Hz |
| S    | 1                    | 1.2   | 1.1    |
| M    | 5.4                  | 6.5   | 6.1    |
| F    | 12.6                 | 12.6  | 12.6   |

### True-RMS AC Voltage

#### Input Characteristics

| Range  | Full Scale<br>5½ Digits | Resolution  |             | Input Impedance |
|--------|-------------------------|-------------|-------------|-----------------|
|        |                         | 5½ Digits   | 4½ Digits*  |                 |
| 200 mV | 199.999 mV              | 1 $\mu$ V   | 10 $\mu$ V  | 1 M $\Omega$    |
| 2V     | 1.99999V                | 10 $\mu$ V  | 100 $\mu$ V | shunted         |
| 20V    | 19.9999V                | 100 $\mu$ V | 1 mV        | by              |
| 200V   | 199.999V                | 1 mV        | 10 mV       | <100 pF         |
| 1000V  | 1000.00V                | 10 mV       | 100 mV      |                 |

\*4½-digits at the fastest reading rate.

## 8840A/AF Specifications

### DC Voltage

#### Input Characteristics

| Range  | Full Scale<br>5½ Digits | Resolution  |             | Input Resistance              |
|--------|-------------------------|-------------|-------------|-------------------------------|
|        |                         | 5½ Digits   | 4½ Digits*  |                               |
| 200 mV | 199.999 mV              | 1 $\mu$ V   | 10 $\mu$ V  | $\geq 10,000 \text{ M}\Omega$ |
| 2V     | 1.99999V                | 10 $\mu$ V  | 100 $\mu$ V | $\geq 10,000 \text{ M}\Omega$ |
| 20V    | 19.9999V                | 100 $\mu$ V | 1 mV        | $\geq 10,000 \text{ M}\Omega$ |
| 200V   | 199.999V                | 1 mV        | 10 mV       | 10 M $\Omega$                 |
| 1000V  | 1000.00V                | 10 mV       | 100 mV      | 10 M $\Omega$                 |

\*4½-digits at the fastest reading rate.

### Accuracy

**Normal (S) Reading Rate:**  $\pm(\% \text{ of Reading} + \text{Number of Counts})$

| Range    | 24 Hour*<br>23°C $\pm$ 1°C | 90 Day<br>23°C $\pm$ 5°C | 1 Year<br>23°C $\pm$ 5°C |
|----------|----------------------------|--------------------------|--------------------------|
| 200 mV** | 0.003 + 3                  | 0.007 + 4                | 0.008 + 4                |
| 2V       | 0.002 + 2                  | 0.004 + 3                | 0.005 + 3                |
| 20V      | 0.002 + 2                  | 0.005 + 3                | 0.006 + 3                |
| 200V     | 0.002 + 2                  | 0.005 + 3                | 0.006 + 3                |
| 1000V    | 0.003 + 2                  | 0.005 + 3                | 0.007 + 3                |

\*Relative to calibration standards

\*\*Using Offset control

**Medium and Fast Rates:** In medium rate, add 2 counts to number of counts. In fast rate, use two 4½ digit counts

# Digital Multimeters

## 8840A Series

### Accuracy

**Normal (S) Reading Rate:**  $\pm(\%$  of Reading + Number of Counts)  
For sinewave inputs  $\geq 10,000$  counts<sup>1</sup>

| Frequency (Hz) | 24 Hour <sup>2</sup><br>23 $\pm$ 1 $^{\circ}$ C | 90 Day<br>23 $\pm$ 5 $^{\circ}$ C | 1 Year<br>23 $\pm$ 5 $^{\circ}$ C |
|----------------|-------------------------------------------------|-----------------------------------|-----------------------------------|
| 20-45          | 1.2 + 100                                       | 1.2 + 100                         | 1.2 + 100                         |
| 45-100         | 0.3 + 100                                       | 0.35 + 100                        | 0.4 + 100                         |
| 100-20k        | 0.07 + 100                                      | 0.14 + 100                        | 0.16 + 100                        |
| 20k-50k        | 0.15 + 120                                      | 0.19 + 150                        | 0.21 + 200                        |
| 50k-100k       | 0.4 + 300                                       | 0.5 + 300                         | 0.5 + 400                         |

<sup>1</sup> For sinewave inputs between 1,000 and 10,000 counts, add to Number of Counts 100 counts for frequencies 20 Hz to 20 kHz, 200 counts for 20 kHz to 50 kHz, and 500 counts for 50 kHz to 100 kHz

<sup>2</sup> Relative to calibration standards

**Medium and Fast Reading Rates:** In medium rate, add 50 counts to number of counts. In fast rate the specifications apply for sinewave inputs  $\geq 1000$  4½ digit counts and  $>100$  Hz

### Operating Characteristics

**Temperature Coefficient:**  $\pm(\%$  of Reading + Number of Counts) per  $^{\circ}$ C, 18 $^{\circ}$ C to 0 $^{\circ}$ C and 28 $^{\circ}$ C to 50 $^{\circ}$ C

| For Inputs           | Frequency in Hz |            |            |
|----------------------|-----------------|------------|------------|
|                      | 20-20k          | 20k-50k    | 50k-100k   |
| $\geq 10,000$ counts | 0.019 + 9       | 0.021 + 9  | 0.027 + 10 |
| $\geq 1,000$ counts  | 0.019 + 12      | 0.021 + 15 | 0.027 + 21 |

### Crest Factor

**Nonsinusoidal Inputs:** For nonsinusoidal inputs  $\geq 10,000$  counts with frequency components  $\leq 100$  kHz, and the following % of reading to the accuracy specifications

| Fundamental Frequency               | 1.0 to 1.5 | 1.5 to 2.0 | 2.0 to 3.0 |
|-------------------------------------|------------|------------|------------|
| 45 Hz to 20 kHz                     | 0.05       | 0.15       | 0.3        |
| 20 Hz to 45 Hz and 20 kHz to 50 kHz | 0.2        | 0.7        | 1.5        |

**Maximum Input:** 1000V rms, or  $2 \times 10^7$  Volts-Hertz product (whichever is less) for any range

**Common Mode Rejection:**  $>60$  dB at 50 or 60 Hz with 1 k $\Omega$  in either lead

### Current

#### Input Characteristics

| Range   | Full Scale<br>5½ Digits | Resolution |             |
|---------|-------------------------|------------|-------------|
|         |                         | 5½ Digits  | 4½ Digits*  |
| 2000 mA | 1999.99 mA              | 10 $\mu$ A | 100 $\mu$ A |

\*4½-digits at the fastest reading rate

### DC Accuracy

**Normal (S) Reading Rate:**  $\pm(\%$  of Reading + Number of Counts)

| Current    | 90 Days 23 $\pm$ 5 $^{\circ}$ C | 1 Year 23 $\pm$ 5 $^{\circ}$ C |
|------------|---------------------------------|--------------------------------|
| $\leq 1$ A | 0.04 + 4                        | 0.05 + 4                       |
| $>1$ A     | 0.1 + 4                         | 0.1 + 4                        |

**Medium and Fast Reading Rates:** In medium reading rate, add 2 counts to number of counts. In fast reading rate, use two 4½ digit counts for number of counts

### AC Accuracy

**Normal (S) Reading Rate:**  $\pm(\%$  of Reading + Number of Counts)  
1 Year, 23 $\pm$ 5 $^{\circ}$ C, for sinewave inputs  $\geq 10,000$  counts

| Frequency in Hertz |           |           |
|--------------------|-----------|-----------|
| 20-45              | 45-100    | 100-5k*   |
| 2.0 + 200          | 0.5 + 200 | 0.4 + 200 |

\*Typically 20 kHz

**Medium and Fast Reading Rates:** In medium reading rate, add 50 counts to number of counts. In fast reading rate, for sinewave inputs  $\geq 1000$  counts and frequencies  $>100$  Hz, the accuracy is  $\pm(0.2\%$  of reading + 30 counts)

### Operating Characteristics

**Temperature Coefficient:** Less than 0.1 x accuracy specification per  $^{\circ}$ C from 18 $^{\circ}$ C to 0 $^{\circ}$ C and 28 $^{\circ}$ C to 50 $^{\circ}$ C

**Maximum Input:** 2A dc or rms ac. Protected with 2A, 250V fuse accessible at front panel, and internal 3A, 600V fuse

**Burden Voltage:** 1V dc or rms ac typical at full scale

### Resistance

#### Input Characteristics

| Range           | Resolution              |                |                | Current Through Unknown |
|-----------------|-------------------------|----------------|----------------|-------------------------|
|                 | Full Scale<br>5½ Digits | 5½ Digits      | 4½ Digits*     |                         |
| 200 $\Omega$    | 199.999 $\Omega$        | 1 m $\Omega$   | 10 m $\Omega$  | 1 mA                    |
| 2 k $\Omega$    | 1.99999 k $\Omega$      | 10 m $\Omega$  | 100 m $\Omega$ | 1 mA                    |
| 20 k $\Omega$   | 19.9999 k $\Omega$      | 100 m $\Omega$ | 1 $\Omega$     | 100 $\mu$ A             |
| 200 k $\Omega$  | 199.999 k $\Omega$      | 1 $\Omega$     | 10 $\Omega$    | 10 $\mu$ A              |
| 2000 k $\Omega$ | 1999.99 k $\Omega$      | 10 $\Omega$    | 100 $\Omega$   | 5 $\mu$ A               |
| 20 M $\Omega$   | 19.9999 M $\Omega$      | 100 $\Omega$   | 1 k $\Omega$   | 0.5 $\mu$ A             |

\*4½-digits at the fastest reading rate.

### Accuracy

**Normal (S) Reading Rate:**  $\pm(\%$  of Reading + Number of Counts)<sup>1</sup>

| Range           | 24 Hour <sup>2</sup><br>23 $\pm$ 1 $^{\circ}$ C | 90 Day<br>23 $\pm$ 5 $^{\circ}$ C | 1 Year<br>23 $\pm$ 5 $^{\circ}$ C |
|-----------------|-------------------------------------------------|-----------------------------------|-----------------------------------|
| 200 $\Omega$    | 0.004 + 3                                       | 0.011 + 4                         | 0.014 + 4                         |
| 2 k $\Omega$    | 0.0028 + 2                                      | 0.01 + 3                          | 0.013 + 3                         |
| 20 k $\Omega$   | 0.0028 + 2                                      | 0.01 + 3                          | 0.013 + 3                         |
| 200 k $\Omega$  | 0.0028 + 2                                      | 0.01 + 3                          | 0.013 + 3                         |
| 2000 k $\Omega$ | 0.023 + 3                                       | 0.027 + 3                         | 0.028 + 3                         |
| 20 M $\Omega$   | 0.023 + 3                                       | 0.043 + 4                         | 0.044 + 4                         |

<sup>1</sup>Using Offset control

<sup>2</sup>Relative to calibration standards

**Medium and Fast Reading Rates:** In medium rate, add to the number of counts 2 counts for the 200 $\Omega$  through 200 k $\Omega$  ranges and 3 counts for the 2000 k $\Omega$  and 20 M $\Omega$  ranges. In fast reading rate, use for the number of counts three 4½ digit counts for the 200 $\Omega$  range and two 4½ digit counts for all other ranges

### Operating Characteristics

**Temperature Coefficient:** Less than 0.1 x accuracy specification per  $^{\circ}$ C from 18 $^{\circ}$ C to 0 $^{\circ}$ C and 28 $^{\circ}$ C to 50 $^{\circ}$ C

**Measurement Configuration:** 2-wire or 4-wire

**Open Circuit Voltage:** Less than 6.5V on the 200 $\Omega$  through 200 k $\Omega$  ranges. Less than 13V on the 2000 k $\Omega$  and 20 M $\Omega$  ranges

**Input Protection:** To 300V rms

### Reading Rates

Reading Rates With Internal Trigger (readings per second)

| Rate | Power Line Frequency* |       |        |
|------|-----------------------|-------|--------|
|      | 50 Hz                 | 60 Hz | 400 Hz |
| S    | 2.08                  | 2.5   | 2.38   |
| M    | 16.7                  | 20    | 19.0   |
| F    | 100                   | 100   | 100    |

\*Sensed automatically at power-up

### General Specifications

**IEEE-488 Interface Function:** Option allows complete control of functions and ranges except DC ratio and data output capability, and supports the following interface function subsets: SH1, AH1, T5, L4, SR1, RL1, DC1, DT1, E1, PP0 and C0

**Common Mode Voltage:** 1000V dc or rms ac from any input to earth ground

**Temperature Range:** 0°C to 55°C operating; -62°C to +85°C storage

**Humidity Range:** 95% RH, +5% -0%

**EMI:** Complies with CE01 (relaxed 20 dB), CE03 (relaxed 10 dB), CS01, CS02, CS06, and RE02 (relaxed 10 dB) as specified in MIL-STD-461

**Altitude:** 4,500m (15,000 ft) operating; 12,000m (40,000 ft) non-operating

**Warmup Time:** 1 hour to rated specifications

**Power:** 100, 120, 220, or 240V ac  $\pm 10\%$  (250V ac maximum), switch selectable at rear panel; 50, 60, or 400 Hz, automatically sensed at power up; 20 VA maximum

**Vibration:** Meets requirements of MIL-T-28800C for Type II, Class 3, Style B equipment

**Size:** 8.9 cm H x 21.6 cm W x 37.1 cm D (3.47 in x 8.5 in x 14.6 in)

**Weight:** Net, 3.4 kg (7.5 lb); shipping 5 kg (11 lb)

**Included:** Line cord, test leads, Instruction/Service Manual, IEEE-488 Quick Reference Guide (with Option -05 only), instrument performance verification record, and serialized/dated calibration certification sheet

### Model

**8840A/AF** Digital Multimeter (NSN 6625-01-196-0014)

### Options

**8840A-05** IEEE-488 Interface

**8840A-05K** Field Installable IEEE-488 Interface

### Service & Support